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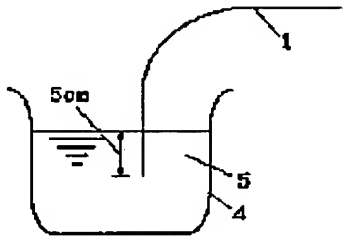
## (54) COVER REMOVING METHOD FOR COATED FIBER OF OPTICAL FIBER CUTTING METHOD AND CONNECTING METHOD FOR OPTICAL FIBER

(57)Abstract:
PURPOSE: To provide the connecting method shortening the connecting time and requiring no thin film coating process by employing the method removing the cover without using concentrated sulfuric acid.
CONSTITUTION: One coated fiber 1 of optical fiber 1 is covered with a heat contraction sleeve. The tip section of the coated fiber 1 of optical fiber is dipped in acetone 5 to swell a cover section, the swollen portion is removed, and the coated fiber 1 of optical fiber is cleaned by ultrasonic waves. A cutting edge is moved in the perpendicular direction at the position of 4mm or below to give a cut, and an optical fiber is pulled in the axial direction and cut. The optical fiber is fused and connected with a core alignment type fusing machine. A proof test is made with a heater mounted on the fusing machine, a bare fiber section is covered with a heat contraction sleeve, it is heated and shrunk, and the connection section is reinforced.

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CLAIMS

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[Claim(s)]
[Claim 1] The covering removal approach of a plastic coated fiber of removing covering using a fixture after being immersed in a covering swelling agent and making it swelling plastic coated fiber covering.
[Claim 2] The covering removal approach of the plastic coated fiber according to claim 1 characterized by removing covering swollen using the fixture with which the elastic member was prepared in the grasping section.
[Claim 3] The covering removal approach of the plastic coated fiber according to claim 1 or 2 characterized by cleaning ultrasonically the plastic coated fiber from which covering was removed.
[Claim 4] Cutting process of the optical fiber which sets cutting length to 4mm or less, and is characterized by making some optical fibers move a cutting cutting edge in the direction of a right angle, and giving and cutting tensile force.
[Claim 5] The connection method of the optical fiber characterized by clamping the covering section of the plastic coated fiber which set the nakedness fiber section to 4mm or less, and welding with a core alignment mold welding machine.
[Claim 6] The connection method of the optical fiber characterized by reinforcing a connection with heat-shrinkable tubing after performing the proof test by predetermined tension in the heating machine carried in the welding machine.
[Claim 7] Cutting length is set to 4mm or less after cleaning ultrasonically the plastic coated fiber from which covering which it is immersed in a covering swelling agent, it was made to swell plastic coated fiber covering, and was swollen using the fixture with which the elastic member was prepared in the grasping section was removed, and covering was removed. Giving tensile force, some optical fibers are made to move a cutting cutting edge in the direction of a right angle, and it cuts. Subsequently The connection method of the optical fiber characterized by reinforcing a connection with heat-shrinkable tubing after performing the proof test by predetermined tension in the heating machine carried in said welding machine after clamping the covering section of an optical fiber and welding with a core alignment mold welding machine.
[Claim 8] The optical fiber which the die length of the nakedness fiber part in a connection is 8mm or less, and has the connection characterized by covering the nakedness fiber part with the heat shrink nature tube.

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the connection method suitable for the connection method of an optical fiber, the undersea fiber optic cable which needs high intensity in a welding connection especially.
[0002]
[Description of the Prior Art] The welding connection method is performed as a connection method of optical fibers. Especially, the connection method of high intensity is adopted about the fusion splicing of the plastic coated fiber in a submarine optical cable. The conventional high intensity connection method can be divided into the process of the following covering removal, washing, cutting, coating, and recoating.
** Covering removal process ... It is the process which removes covering of a plastic coated fiber, and it is immersed in hot concentrated sulfuric acid for several minutes, and covering is melted and removed.
** Washing process ... It is the process which washes the concentrated sulfuric acid which remained using the acetone.
** Cutting process ... It is the process which cuts the nakedness fiber section which covering was removed and was exposed to predetermined die length. The length of cut is 12mm and the method of giving no external force is used on the occasion of cutting.
** Coating process ... A thin-layer-coating machine is used and about 60-micrometer coating is performed except for 2mm of tips of a nakedness fiber.
** Fusion splicing process ... A core direct viewing type fusion splicing machine is used, the part which gave thin layer coating is pressed down by the fiber clamp, and fusion splicing is performed.
** Recoating process ... Coating of the diameter of covering of a plastic coated fiber and the diameter of equivalent is performed to the connected nakedness fiber section. The die length of the nakedness fiber section to which covering is given is 24 twice as manymm as the length of cut.
[0003] In a covering removal process, in order to use concentrated sulfuric acid for the connection method mentioned above, the washing process of not being not only desirable but concentrated sulfuric acid is required for it from the field of safety. It is especially inapplicable to an activity [ in a narrow location ]. Moreover, for the clamp of the nakedness fiber section in a fusion splicing process, thin layer coating is needed, the time amount which connection takes for the increment in a routing counter becomes long, and the total connect time has become also in 1 hour. Furthermore, there was also a problem that possibility of giving a trauma to an optical fiber was large, and the yield of connection worsened by termination in order to use three kinds of machines called a thin-layer-coating machine, a fusion splicing machine, and a recoating machine, from connection initiation.
[0004]
[Problem(s) to be Solved by the Invention] By having been made in order to solve an above-mentioned trouble, and adopting the approach of removing covering, without using concentrated

sulfuric acid in a covering removal process, this invention shortens the time amount which connection takes, and also aims a thin-layer-coating process at offering the connection method made unnecessary.

[0005]

[Means for Solving the Problem] This invention is set to invention according to claim 1. After being immersed in the covering swelling agent and making it swell plastic coated fiber covering in the covering removal approach of a plastic coated fiber, It is characterized by removing covering using a fixture, and sets to invention according to claim 2. It is characterized by removing covering swollen in invention according to claim 1 using the fixture with which the elastic member was prepared in the grasping section, and sets to invention according to claim 3. In invention according to claim 1 or 2, it is characterized by cleaning ultrasonically the plastic coated fiber from which covering was removed.

[0006] In invention according to claim 4, in the cutting process of an optical fiber, cutting length is set to 4mm or less, and some optical fibers are made to move a cutting cutting edge in the direction of a right angle, and it is characterized by giving and cutting tensile force.

[0007] In invention according to claim 5, it sets to the connection method of an optical fiber. Clamp the covering section of the plastic coated fiber which set the nakedness fiber section to 4mm or less, and it is characterized by welding with a core alignment mold welding machine, and sets to invention according to claim 6. After performing the proof test by predetermined tension in the heating machine carried in the welding machine, it is characterized by reinforcing a connection with heat-shrinkable tubing.

[0008] In invention according to claim 7, it sets to the connection method of an optical fiber. Cutting length is set to 4mm or less after cleaning ultrasonically the plastic coated fiber from which covering which it is immersed in a covering swelling agent, it was made to swell plastic coated fiber covering, and was swollen using the fixture with which the elastic member was prepared in the grasping section was removed, and covering was removed. Giving tensile force, some optical fibers are made to move a cutting cutting edge in the direction of a right angle, and it cuts. Subsequently After performing the proof test by predetermined tension in the heating machine carried in said welding machine after clamping the covering section of an optical fiber and welding with a core alignment mold welding machine, it is characterized by reinforcing a connection with heat-shrinkable tubing.

[0009] In invention according to claim 8, in the optical fiber which has a connection, the die length of the nakedness fiber part in a connection is 8mm or less, and it is characterized by covering the nakedness fiber part with the heat shrink nature tube.

[0010]

[Function] According to invention according to claim 1 to 3, by making covering of a plastic coated fiber swell by the covering swelling agent, for example, an acetone, it is not necessary to use concentrated sulfuric acid etc., and a trauma is not given to a nakedness fiber, but removal of covering can be performed easily mechanically. Moreover, mechanical removal becomes easier by using the fixture with which the elastic member was prepared in the grasping section. After removing covering, the nakedness fiber section without adhesion, such as dust, is obtained by [ which are cleaned ultrasonically ] doing things.

[0011] According to invention according to claim 4, by having shortened cutting length with 4mm or less, bending of a nakedness fiber decreased and it became possible to clamp the covering section. A reinforcement part can be shortened as a result. It can cut by short cutting length by making some optical fibers move a cutting cutting edge in the direction of a right angle, and giving and cutting tensile force. The thin-layer-coating process currently performed conventionally becomes unnecessary, without according to invention given in claims 5 and 6, giving a trauma to a nakedness fiber, since the covering section is clamped. Furthermore, a recoating process can be skipped by performing the proof test and connection reinforcement after connection at the heating heater of the same welding inside of a plane.

[0012] According to invention according to claim 7, covering of a plastic coated fiber is easily removable, without using concentrated sulfuric acid, though a thin-layer-coating process and a recoating process are unnecessary and natural, all the activities after fiber welding will be done

within the same machine, and giving a trauma to the nakedness fiber section becomes that there is nothing.

[0013] According to invention according to claim 8, the die length of the nakedness fiber part in a connection is 8mm or less, and the connection of high intensity is obtained by covering the nakedness fiber part with the heat shrink nature tube.

[0014]

[Example] The connection process of an optical fiber explains one example of this invention. Drawing 1 is a flow chart and drawing 2 is [ the explanatory view of cutting process and drawing 4 of the explanatory view of the covering removal approach and drawing 3 ] the explanatory views of a connection method. the inside of drawing, and 1 -- a plastic coated fiber and 2 -- the covering section and 3 -- the nakedness fiber section and 4 -- a container and 5 -- for a movable clamp and 8, as for V slot material and 10, a cutting cutting edge and 9 are [ an acetone and 6 / a fixed clamp and 7 / a clamper and 11 ] migration stages.

[0015] S1 is a last process. The tip of the plastic coated fiber of comrades to connect is cut in a suitable location, and the sleeve of heat shrink nature is put on one plastic coated fiber. The die length of a sleeve is die length longer than the die length of the nakedness fiber section after connection.

[0016] S2 - S4 are covering removal processes. The point of a plastic coated fiber 1 is immersed for several minutes in the covering swelling agent 5, for example, an acetone, and the covering section is made to swell in S2, as shown in drawing 2 . In S3, the part which the tip of a plastic coated fiber swelled is grasped with the fixture which equipped the grasping section with the elastic member, and it removes so that a trauma may not be given to the nakedness fiber section. In S4, the point of the optical fiber from which covering was removed is cleaned ultrasonically. The acetone was used for the penetrant remover in this example. The minute dust which remained in the nakedness fiber section by ultrasonic cleaning is removable.

[0017] The following S5 is a cutting process. As shown in drawing 3 , it clamps near the tip of the nakedness fiber section 3 by the fixed clamp 6, and the covering section 2 is clamped by the movable clamp 7. Since the covering section 2 is clamped, it is not necessary to give thin layer coating for protection to the nakedness fiber section 3 like the conventional example which clamps the nakedness fiber section. Subsequently, a blemish is given moving the cutting cutting edge 8 in an optical fiber and the direction of a right angle, and the movable clamp 7 is lengthened and cut to the shaft orientations of an optical fiber. Die-length d from the edge of the covering section 2 to a cutting location is 4mm or less.

[0018] S6 and S7 are connection processes. Fusion splicing of the axial doubling is performed and carried out in S6, pressing down the covering section 2 by V slot material 9 and the clamper 10, and looking at the nakedness fiber section under a microscope using the core alignment mold welding machine which can face a core squarely, as shown in drawing 4 . It is made to move to the location of the nakedness fiber section where the heat shrink nature sleeve put on one optical fiber by S1 was connected, and in the heating machine using the heating heater carried in the welding machine, after performing the proof test by predetermined tension, heat a heat shrink sleeve, it is made to contract, and a connection is reinforced with S7. Using a thing longer than the die length of the nakedness fiber section, it unites with the covering section of the both sides of the nakedness fiber section by the heat shrink nature sleeve, and the die length of a heat shrink nature sleeve reinforces the nakedness fiber section.

[0019] The example of the above example is explained. It soaks in the acetone into which the optical fiber was put by the container for about 10 minutes, and it is made to swell covering about 5cm at a covering removal process. Then, it removed so that a trauma might not be given using the fixture mentioned above. Instead of making it swell using a swelling agent, after heating the covering section, you may draw out, but after making it swell, as compared with the case where it draws out, the reinforcement of a connection falls to about 80%. Then, in the acetone, ultrasonic cleaning was performed and the minute dust of the covering removal section was removed. If ultrasonic cleaning is not performed, the reinforcement of a connection will fall to about 70%.

[0020] At the cutting process, it cut by the approach explained by drawing 3 , and the die length

of the nakedness fiber section was shortened. Although experimented in cutting length by 4mm and 3mm, as for the reinforcement of a connection, the direction of 3mm became high.
[0021] At the fusion splicing process, the fiber core alignment mold welding machine was used, and as drawing 4 explained, fusion splicing of the fiber was clamped and carried out. The die length of the nakedness fiber section after connection is 8mm or 6mm in this example, and the 28-40mm thing was used for the die length of the heat shrink nature sleeve for reinforcement. The total connect time of the above process was for about 10 minutes.
[0022]
[Effect of the Invention] Since according to this invention connection working hours can be shortened and a powerful drug is not used so that clearly from the above explanation, a safe activity can be performed. Moreover, the facility which connection takes can work at the almost same facility as what is used for general connection of the usual land etc., and the same process, even when connecting a submarine cable. Connection resilience can guarantee reinforcement sufficient as high intensity connection, and its dependability of a connection improves. Therefore, it is effective in the ability to use it easily as high intensity connection for the usual connection.

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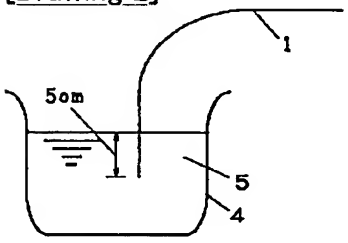
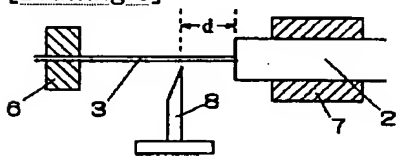
DRAWINGS

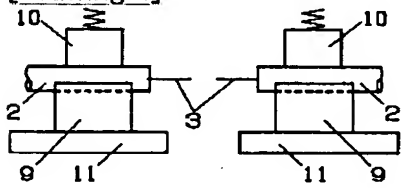
[Drawing 2]



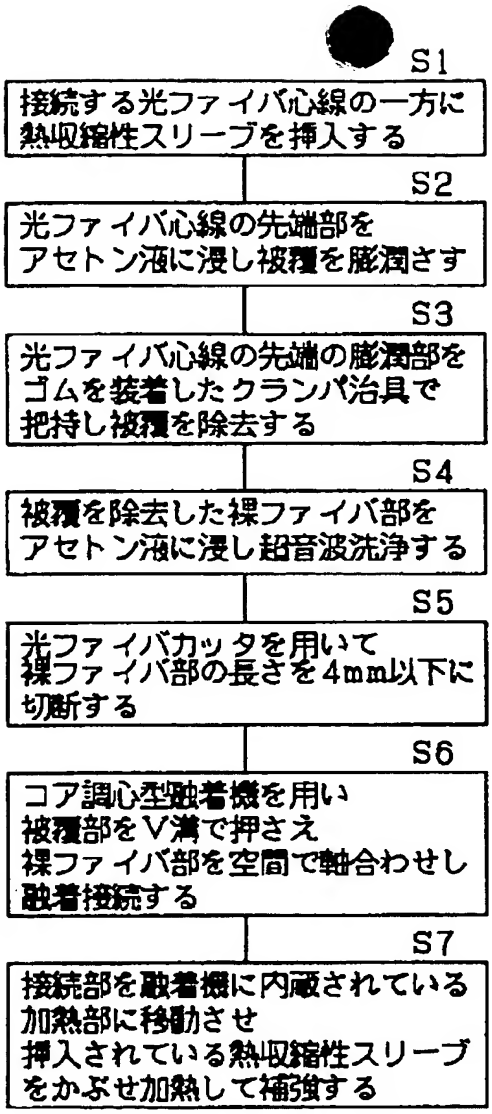

[Drawing 3]




[Drawing 4]




[Drawing 1]

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